PROJECT NUMBER: 2501
PROJECT TITLE: Smoke Chemistry
PROJECT LEADER: R. Comes
PERIOD COVERED: April, 1988
WRITTEN BY: D. Douglas

I. SIDESTREAM SMOKE

A. Objective: Conduct analyses on mainstream and sidestream smoke to determine qualitative and quantitative differences between control and reduced visibility cigarettes. Develop methods to analyze for selected components. Demonstrate effective methods for reduction or removal of these components.

B. Status: (1) Quantitative amounts of specific compounds are being added to cigarettes. Their sidestream smoke is then analyzed using silica gel collection and elution techniques. The purposes of this work are to correlate subjective data with this analytical data and to examine the sensitivity of the analytical method to changes affecting the odor or other subjective qualities of the sidestream smoke. (2) Sidestream and mainstream smoke from a 17 mm circumference cigarette was compared to that from Ky. Ref. 1R4F cigarettes using the silica gel collection and fractionation procedure followed by gc analysis.

C. Conclusions: (1) Preliminary results indicate that analytical gc data obtained by this method produce obvious differences only when significant differences in odor are present. (2) No notable differences were found by this method.

D. Plans: Gas phase analysis techniques are being developed to compare sidestream smoke samples generated from conventional and various low sidestream cigarette models. Concentration-desorption techniques are a part of this effort. Additional work is in progress to define the ability of the silica gel technique to identify specific component differences in sidestream samples derived from different types of cigarettes.

II. MISCELLANEOUS

A. Objective: (1) Construct an environmental chamber to measure components of sidestream smoke under carefully controlled conditions. (2) Conduct sidestream smoke visibility measurements as required. (3) Upgrade computer and instrumental capabilities for the project. (4) Determine experimental conditions necessary to support the program to incorporate selected ingredients into cigarette models to improve sidestream smoke properties.

B. Results: (1) Modification of the lab/removal of old lab furniture, etc. will be initiated in May. Chamber design specifications have been sent to a vendor for preliminary plans and cost estimates. (2) Trim models have been completed. RL/humectant-study models are being measured. (3) The HP-MSD is now able to acquire data with one data station while different data is simultaneously analyzed with the other. A second

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plotter has been interfaced to the MSD. Procedures have been written to allow the mass spectral data for an entire chromatogram to be analyzed unattended. (4) The gc-ms analysis of vanillin (produced by pyrolysis of glucovanillin) in mainstream and sidestream smoke was facilitated by the use of cool, on-column gc injection.

C. **Conclusions**: (1) The environmental chamber project is currently concentrating on lab renovation and chamber design specifications. Preliminary planning of instrumentation and data handling aspects of the project has been conducted. This includes determining specifications for the types of microcomputers needed for data collection and reporting. Discussions with vendors of analytical equipment have emphasized concentration techniques, particulate measurement techniques and an investigation of the feasibility of FTIR as a technique for measurement of some components. (2) As expected, the sidestream smoke visibility is decreased with the reduced circumference cigarettes. Additional reductions occur with small-particle-size additives. (3) The changes in configuration and enhancements of data analysis have at least doubled productivity for this instrument and its operator. (4) Use of excessive heat in the analysis of vanillin will degrade the sample.

D. **Plans**: (1) Details of the finalized chamber design will be specified and final vendor selection will be made. Appropriate analytical instrumentation is being evaluated so that the chamber design will incorporate features necessary for the proper use of the instrumentation. (2) The smoke visibility apparatus will be moved to a conditioned room to maintain constant environmental conditions and to determine whether the temperature and humidity conditions in a conditioned environment affect visibility. (3) Continue gc-ms analyses for sidestream studies. Adapt the concentration procedure and/or valve-operated multi-dimensional chromatography to this instrument to effect additional compound identifications. (4) The vanillin analysis will be completed. Several Project Art samples will be analyzed by gc-ms.

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